THE WEATHER AND CIRCULATION OF JUNE 1968

Unusual Tropical Activity

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1. WEATHER HIGHLIGHTS

Two hurricanes and a tropical storm in the Gulf of Mexico and nearby Atlantic were the most notable weather features of June. Excluding 1968, only 47 June tropical storms or hurricanes have been reported in that area since 1871. Wind damage was minor from the two storms that made landfall this month but heavy precipitation resulted from both. Rainfall with hurricane Abby the first week ranged upward to 13 in., helping to make this the wettest June of record at Miami, Orlando, and Lakeland, Fla. Storm totals with Candy about 3 weeks later were 5 to 10 in. with local flooding at numerous locations in eastern Texas.

Much severe weather occurred between the Rocky and Appalachian Mountains. Tornadoes were especially numerous during June 10–16 when one of them took nine lives and injured 125 persons at Tracy, Minn. Snowfall was reported at higher elevations in the Rocky Mountains on the 29th and 30th. A trace at Salt Lake City, Utah, was the first June snowfall since the 2d in 1943. The associated freeze over parts of eastern Idaho, Wyoming, Nevada, and Utah caused some damage to crops. In contrast Phoenix, Ariz., reported 4 consecutive days with maximum temperatures 115°F. or higher, the first time that 4 days with 115°F. or higher had been recorded during any month.

2. HEMISPHERIC MEAN CIRCULATION

Fast westerlies with little amplitude dominated the circulation at middle latitudes from the western Pacific to Europe (fig. 1). Negative height anomalies along the northern edge of the westerly belt contributed to unusually fast wind speeds, especially in the northeastern Pacific and the northeastern Atlantic where the height anomaly gradient was very strong (fig. 2). Between the Gulf of Alaska Low and the subtropical High maximum winds averaged more than 20 m.p.s., about 13 m.p.s. faster than normal. In the Atlantic the highest speed was 16 m.p.s. and its anomaly +8 m.p.s. The zonal index from 35° to 55°N. lat. and Greenwich meridian westward to 180° long. rose 1.4 m.p.s. from May to June against the normal falling trend.

Increasing westerlies at midlatitudes were one symptom of a substantial decrease of the extensive blocking of May [1]. In June blocking was still prominent over the Bering Sea but it was much weaker over Canada and Greenland. Figure 3 illustrates the changes (normal removed) that occurred as blocking relaxed, or moved, from May to June. Rises centered over the New Siberian Islands indicate its retrogression to northeastern Asia. Elsewhere, heights fell in the Gulf of Alaska and Denmark Strait as mean Lows moved eastward. Rises accompanied the growth of the subtropical High in the eastern Pacific and the decay of troughs near the Great Lakes and Newfoundland. Large falls in central Asia marked the deepening and eastward progress of a trough from Europe. Rises along 40°N. in the United States and falls along 25°N. indicate the northward shift of the subtropical ridge and stronger easterly flow that favored tropical disturbances in the Gulf of Mexico and western Atlantic.

3. TEMPERATURE AND PRECIPITATION

Departures of average temperature from normal were generally small (fig. 4) and in good agreement with anomalies of the circulation. Temperatures and 700-mb. heights were below normal in States bordering Canada, the south Atlantic coast, and the western Gulf of Mexico, but above normal in the Far West. Wide variations occurred during the month and no monthly average temperature records were established. Temperatures rose more rapidly than usual from May to June in most States as blocking decreased over North America, except in Texas and Florida owing to increased rainfall and cloudiness.

Precipitation totals for the month along the path of Abby ranged from more than 22 in. over southeastern Florida to 4 in. over eastern Tennessee (fig. 5 and 6). Storm totals of 13 in. were recorded in Florida and 11 in. in South Carolina. Moisture carried northward by the storm may also have contributed to heavy rains along the middle Atlantic coast on June 12–13.

In eastern Texas and adjoining States the largest 24-hr. totals resulted from tropical storm Candy. Moisture from Candy probably helped to produce heavy rainfall as far north as the Great Lakes Region.

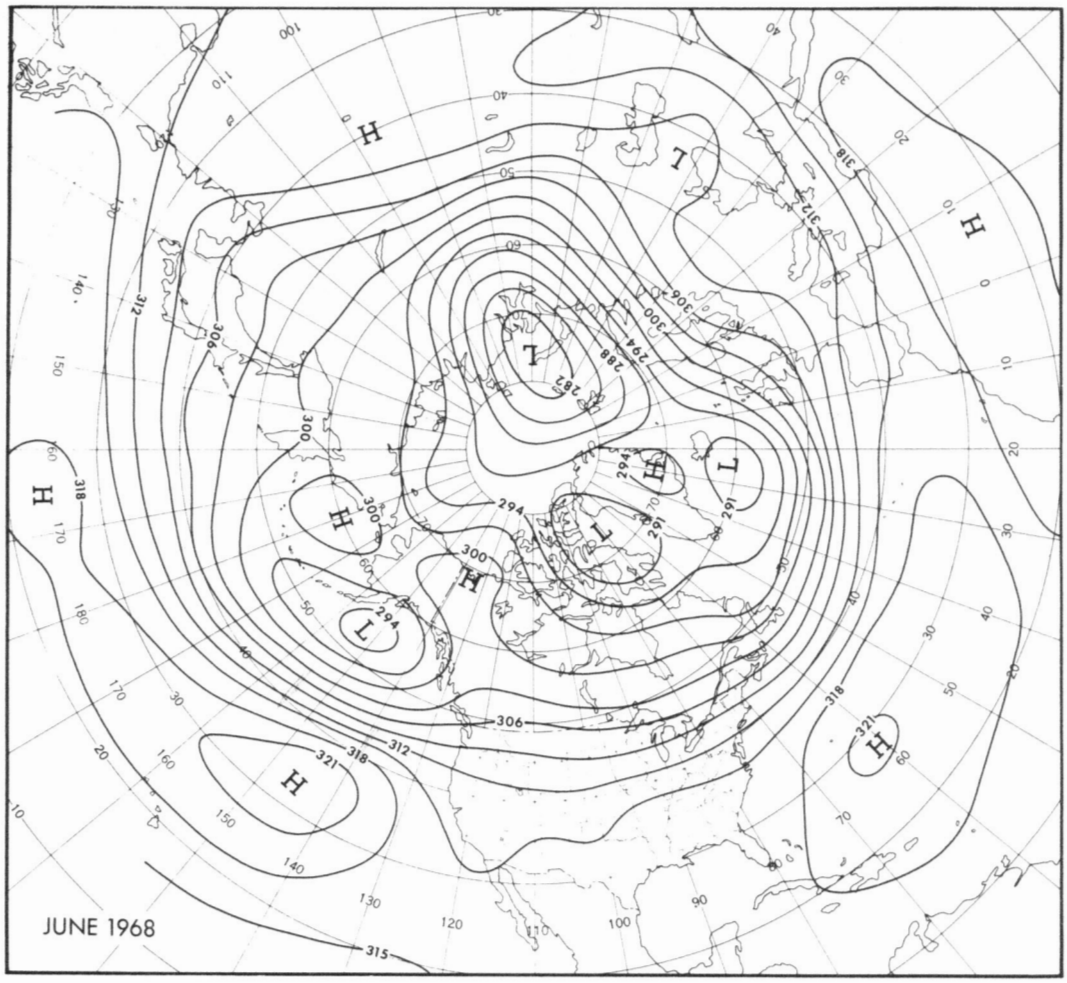


FIGURE 1.—Mean 700-mb. contours (decameters) for June 1968.

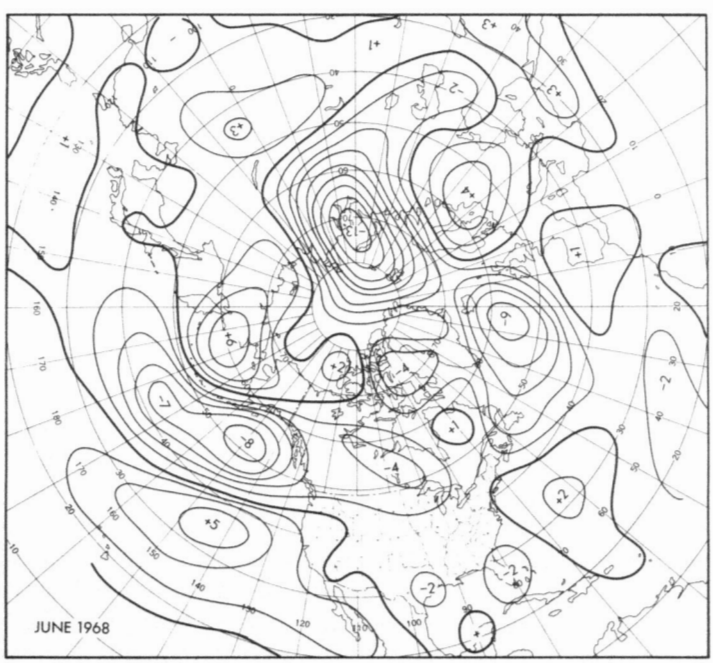


FIGURE 2.—Departure from normal of 700-mb. height (decameters) for June 1968.

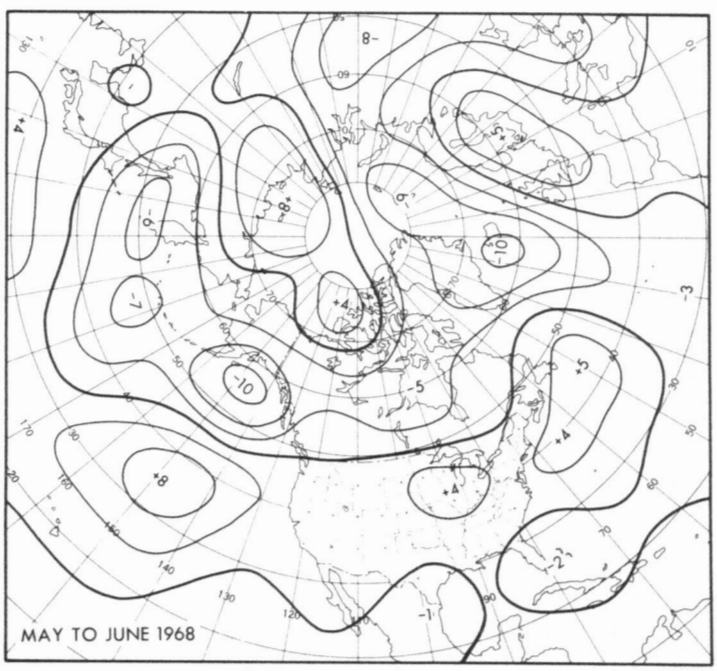


FIGURE 3.—Mean 700-mb. height anomaly change (decameters) from May to June 1968.

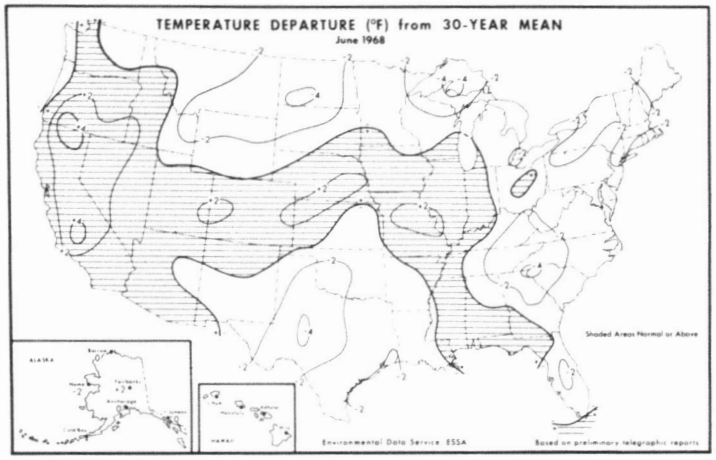


FIGURE 4.—Departure from normal of average surface temperature (°F.) for June 1968 (from [2]).

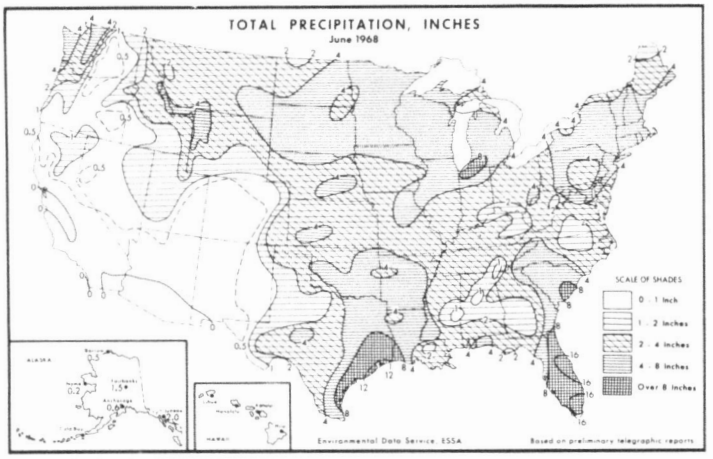


FIGURE 5.—Total precipitation (in.) for June 1968 (from [2]).

Much of the heavy precipitation in the Rockies and Northern Plains occurred in early June along with widespread severe weather ahead of a vigorous trough. West of the Divide and over the southern Rockies, under anomalous northwesterly flow (fig. 2), little precipitation fell except where orographic conditions were favorable, mostly in Washington.

4. TROPICAL CYCLONES

Hurricane Abby was detected in the tropical depression stage near western Cuba on June 2 (fig. 6). It became a hurricane the following afternoon, moved inland on the 4th near Punta Gorda, Fla., and weakened considerably. After milling around the Cape Kennedy area from early the 5th until the morning of the 6th the storm skimmed along the northern Florida coast, crossed the Georgia coast just south of Brunswick, and began to deteriorate over land. Remnants had drifted to central North Carolina by the 10th.

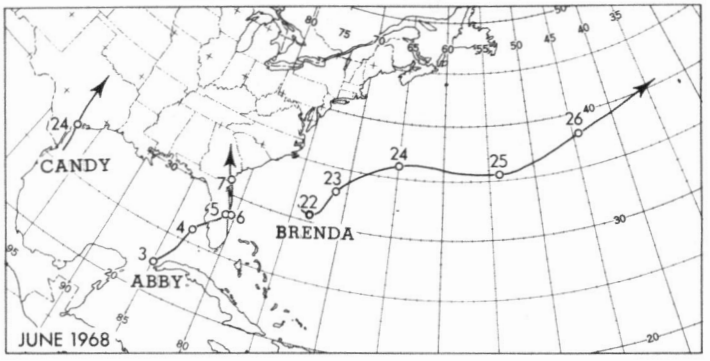


FIGURE 6.—Preliminary smoothed tracks of selected tropical cyclones in June 1968. Dated circles are estimated positions at 0000 GMT.

Brenda formed in the Florida Straits on the 18th, moved northward over Florida as a tropical depression, and became a tropical storm in the western Atlantic on the 21st. This storm increased to a hurricane on the 23d, was caught up by westerlies aloft on the 24th, decreased to a tropical storm on the 25th, and became extratropical on the 26th.

Tropical storm Candy developed on June 23 just east of Brownsville, Tex., in a large area of cloudiness and showers that had persisted for several days in the western Gulf of Mexico. Candy entered the coast near Corpus Christi, Tex., during the late afternoon of the 23d with 60-m.p.h. winds, gusts to 72, 4-ft tides, then weakened rapidly over eastern Texas.

In the western Pacific tropical storm Kim increased to a typhoon on June 1 about 600 mi. east of Luzon. Kim curved northeastward and became extratropical southeast of Japan on the 4th. Tropical storm Lucy was first reported on the 28th about 1,300 mi. east of Luzon, upgraded to a typhoon the 29th, and recurved toward southern Japan on the 30th. In the eastern Pacific tropical storm Annette was briefly observed on June 20–21.

5. WEEKLY CIRCULATION AND WEATHER

During the first week there was a deep trough in the West, a cutoff Low over Florida, and 700-mb. height anomalies were negative except over the northeast quarter of the Country (fig. 7A and B). Surface temperatures were lower than normal in these cyclonic regions, but higher than normal where the ridge was dominant over the Northeast (fig. 7C). New daily maximum temperatures were recorded at Sioux City, Iowa, and Minneapolis-St. Paul, Minn. It was very wet from southern Florida to southwestern Virginia along the path of Abby (fig. 6 and 7D). Heavy showers also occurred with weak tropical activity along the Texas coast and in southwesterly flow east of the western trough. Tornadoes were sighted in Texas, Oklahoma, Kansas, Minnesota, and Illinois, but none caused extensive damage.

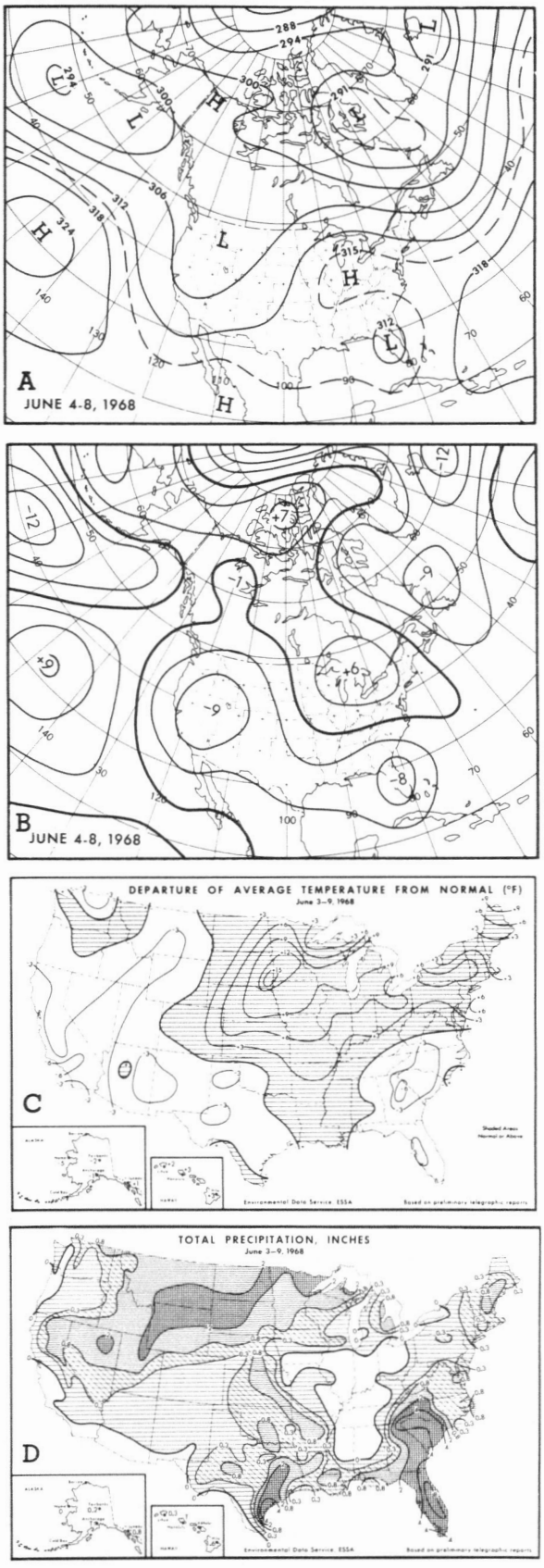


FIGURE 7.—(A) Mean 700-mb. contours and (B) departure of 700-mb. mean from normal (both in decameters) for June 4–8, 1968; (C) surface temperature departure from normal (°F.); and (D) total precipitation (in.) for June 3–9, 1968 (from [2]).

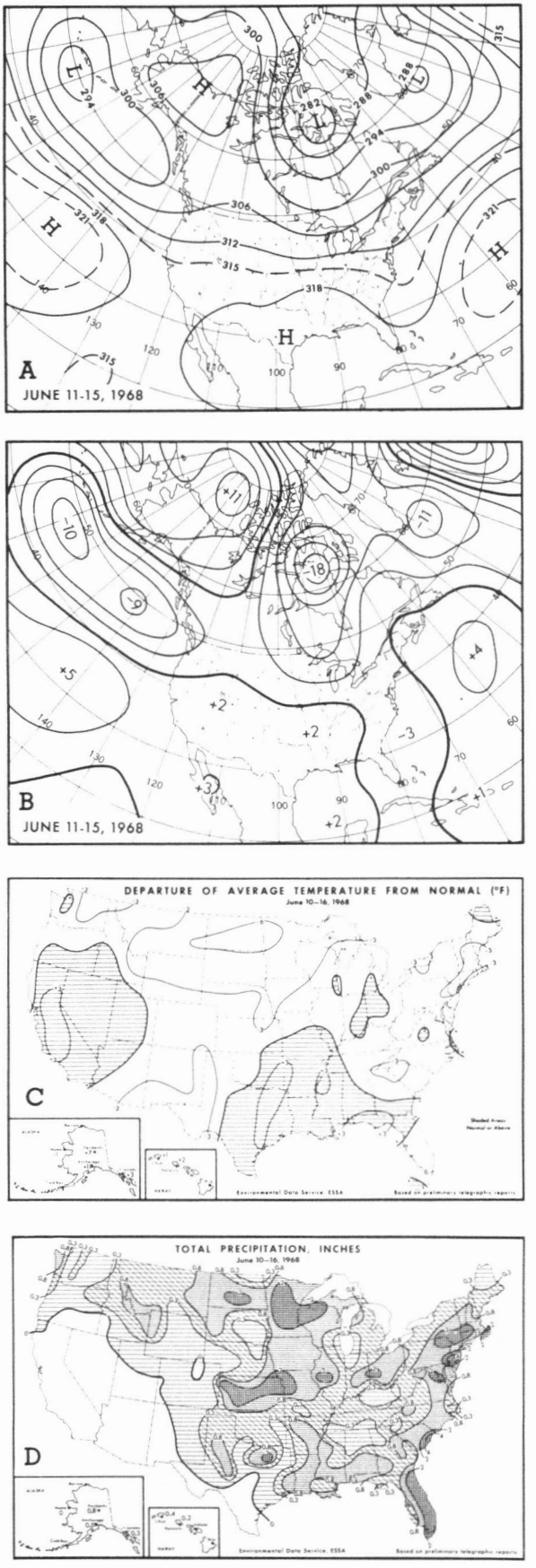
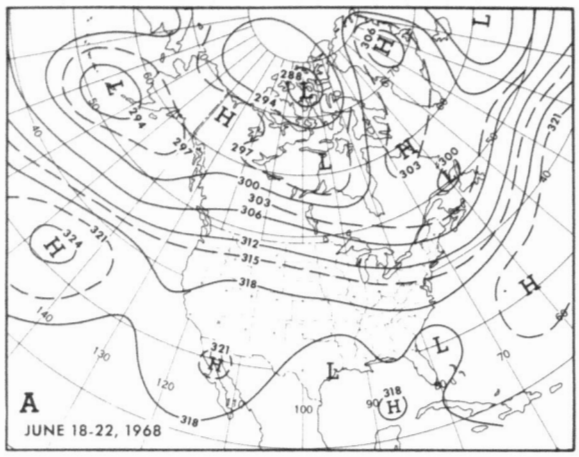
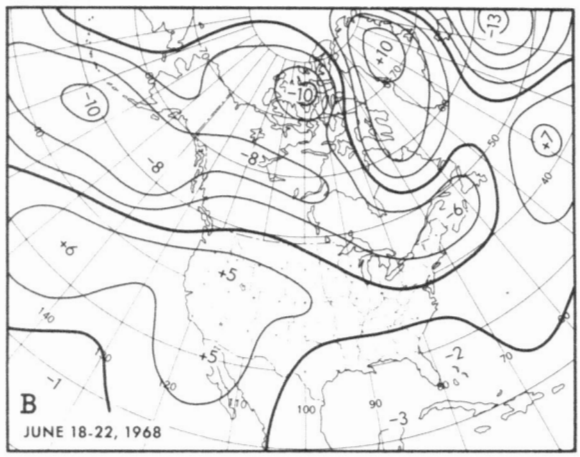
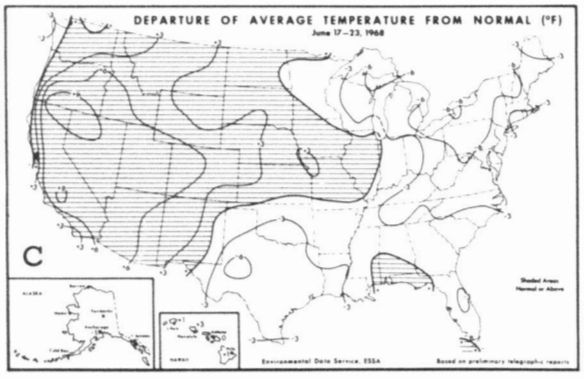


FIGURE 8.—Same as figure 7 except (A) and (B) for June 11–15, 1968; (C) and (D) for June 10–16, 1968 (both from [2]).







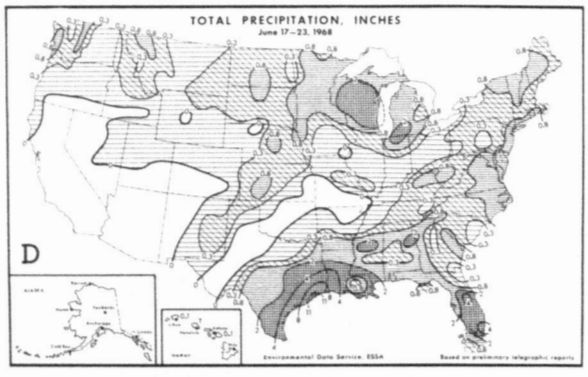
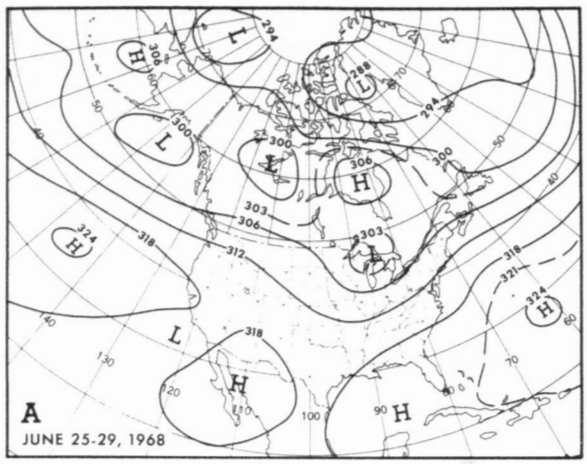
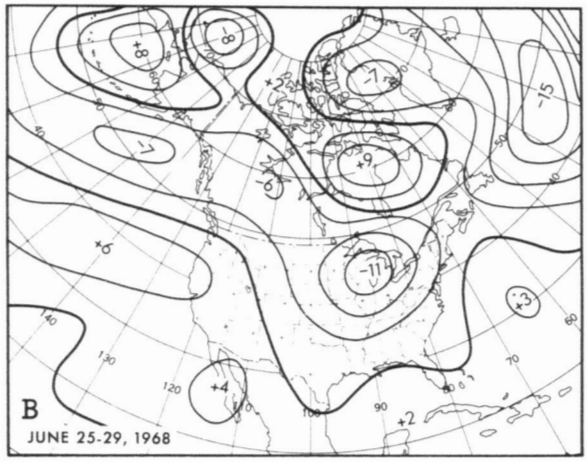
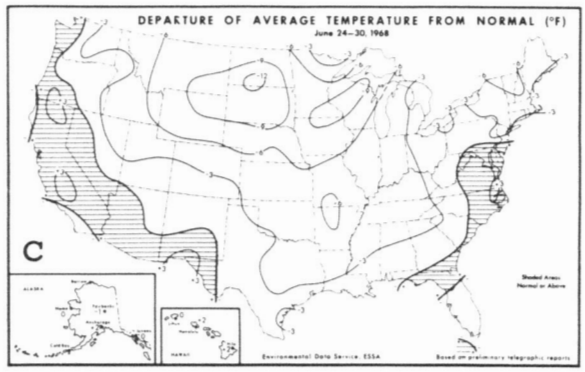


FIGURE 9.—Same as figure 7 except (A) and (B) for June 18–22, 1968; (C) and (D) for June 17–23, 1968 (both from [2]).







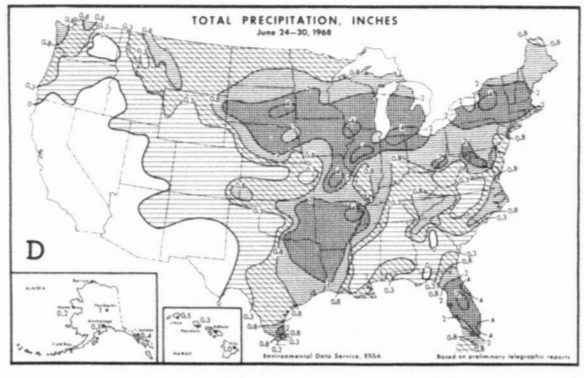


FIGURE 10.—Same as figure 7 except (A) and (B) for June 25–29, 1968; (C) and (D) for June 24–30, 1968 (both from [2]).

The circulation of the following week was much less cyclonic in the West and South, more cyclonic over the Great Lakes Region, but changed little along the south Atlantic coast (fig. 8A and B). Much higher temperatures prevailed in the Far West and eastern Texas but it was cooler from the Northern Plains to New England (fig. 8C). New daily minima were established at widely scattered cities from Helena, Mont., to Spartanburg, S.C. Many showers and thundershowers were set off as cool air replaced the warm air along a slow-moving cold front. Tornadoes were reported from Wisconsin to Texas early in the week and in the Northern Plains near midweek. A short wave trough and the moist remnants of Abby combined to produce heavy showers along the middle Atlantic coast. Twenty-four-hr. rainfall amounts of more than 4 in. were reported in New Jersey (fig. 8D).

The western ridge strengthened the third week while the circulation became more cyclonic in the Gulf of Mexico and a new Low became cut off east of Florida (fig. 9A, B). Hurricane Brenda developed north of the Bahamas and tropical storm Candy formed along the Texas coast. Warming continued in the West where record daily high temperatures were reported in Arizona, Colorado, and South Dakota. It was cooler in the East with new daily minima established in West Virginia, Pennsylvania, and Vermont. Showers fell nearly every day over the Northern Plains with some damaging wind and hail. Heavy rain occurred along the Texas coast from tropical storm Candy and in southern Florida (fig. 9D).

During the final week 700-mb. heights were lower over most of the United States with a deep Low over the Great Lakes Region (fig. 10A, B). Temperatures averaged below normal over most States. Daily minimum records were superseded in the central Rockies, Central Plains, and southern Appalachians as cold air swept southward from Canada behind a huge storm that developed over the Central Plains. Precipitation from this storm, combined with more from remnants of tropical storm Candy, made this a wet week in several States (fig. 10D). Tornadoes were numerous and occurred in Colorado, Kansas, Arkansas, Missouri, Iowa, and Ohio. A fresh burst of Arctic air brought snowfall in the northern Rockies the last 2 days of the month.

REFERENCES

1. L. P. Stark, "The Weather and Circulation of May 1968—Cool Weather with Widespread Blocking," *Monthly Weather Review*, Vol. 96, No. 8, Aug. 1968, pp. 577–583.
2. Environmental Data Service, ESSA, *Weekly Weather and Crop Bulletin*, Vol. 55, No. 24–28, June 10, 17, 24, July 1 and 8, 1968, pp. 1–8.